10. Pablo

Program Name: Pablo.java Input File: pablo.dat

Pablo is developing an app for runners, walkers or travelers that will track how far a user has run, walked or traveled. He is starting out by developing a prototype that will simply determine the distance between where the user started recording their activity and where they stop. The formula to calculate the distance between two locations determined by their GPS coordinates is the Haversine formula:

Haversine:

$$a = \sin^2\left(\frac{\Delta\phi}{2}\right) + \cos(\phi_1) \cdot \cos(\phi_2) \cdot \sin^2\left(\frac{\Delta\lambda}{2}\right)$$

With:

$$c = 2 \cdot arctan2\left(\sqrt{a}, \sqrt{1-a}\right)$$

and:

$$d = R \cdot c$$

Where:

ϕ = latitude
λ = longitude
R = 6371 (Earth's mean radius in km)

The units for latitude and longitude are degrees. $\Delta\emptyset$ = the difference between the latitudes. $\Delta\lambda$ = the difference between the longitudes.

$$\sin^2\left(\frac{\Delta\emptyset}{2}\right) = \sin\left(\frac{\Delta\emptyset}{2}\right) * \sin\left(\frac{\Delta\emptyset}{2}\right)$$

Pablo wants to report the distance between the starting point and the ending point in meters.

Input: A number N representing the number of pairs of starting and stopping points. N lines of data each containing four values: latitude and longitude of the starting point and the latitude and longitude of the stopping point. All values are in degrees.

Output: For each line of data print "The distance between " (coordinates of start shown with 5 decimal places) then " and " followed by (coordinates of end shown with 5 decimal places) followed by " is " followed by a space and the distance travelled in meters rounded to a whole number followed by a space and finally "meters.". The distance between the points will never exceed Double.MAX_VALUE.

Sample input:

```
4
31.37646 -100.44892 31.36184 -100.43369
30.28017 -97.73871 30.27521 -97.74011
30.28642 -97.73645 30.28771 -97.73333
30.26557 -97.74465 29.76694 -95.37830
```

Sample output:

```
The distance between (31.37646, -100.44892) and (31.36184, -100.43369) is 2176 meters.
The distance between (30.28017, -97.73871) and (30.27521, -97.74011) is 568 meters.
The distance between (30.28642, -97.73645) and (30.28771, -97.73333) is 332 meters.
The distance between (30.26557, -97.74465) and (29.76694, -95.37830) is 234481 meters.
```